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An improved Database Moving Objects Indexing for Efficient Query Processing

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Abstract

Recent advances in positioning technologies and wireless communications leadto a proliferation of location-based services. The moving-object database is aspecialized database system for efficiently storing and processing the locationdata in location-based services. The dynamic nature of objects introduces newchallenges to existing database techniques, especially dealing with the frequentlocation updates. Given the massive number of GPS-equipped mobile devicesand the spectacular growth rate today, it is of vital importance to consistentlyimprove the performance of moving-object databases.

The problem of moving-object management has attracted great attention from the researchers. For a long time, researchers want to enhance the performance of the database system, as the traditional databases are designed for static objects, for which updates are infrequent. Moving-object databases, on the other hand, are proposed specially for managing moving objects, whose locations change frequently over time. To track the objects continuously, objects are required to inform the system about the changes of their locations, resulting a huge updating workload to the database system. The high frequency of updates on the data is a unique feature that differentiates the moving-object database from traditional databases.

Therefore, many researches have gone to indexing and querying moving objects. Therefore, this thesis addresses the essential issues of moving objects: (1) Understanding the moving object features. (2) Indexing techniques for moving objects. (3) Different query types for moving objects.

In this dissertation, we exploit the possibility of enhancing the performanceof moving-object databases. Based on the strengthsand drawbacks of existing indexes revealed by the study, we designan index structure for moving objects based on hybridized the two index technique the R-tree and Uniform grid. The new index structure focuses on the current and the near future. The R-tree is used to divide the space into MBRs then a uniform grid is used in non-leaf nodes to store the data object and to reduce the overlapping between MBRs. Moreover, in the hybridized index structure, we enhance the update, insertion, and deletion algorithms to reduce the updates cost and efficiently supports the spatial queries. The results of extensive performancestudy show that the proposed index structure take one step further towardsoptimizing the performance of indexing moving-objects.